

60. (Amended) A method for removing organic contaminants from a substrate comprising the steps of:

holding said substrate in a tank; and

filling said tank with a fluid comprising water, ozone and an additive acting as a scavenger, and wherein the fluid is comprised substantially of water.

#### REMARKS

In paragraph two of the Office Action, claim 41 was objected to for being dependent on a canceled claim. Applicants have amended claim 41 to overcome the objection.

In paragraph four of the Office Action, claim 60 was rejected under 35 U.S.C. §112, first paragraph. Specifically, the Office Action states that the specification enables the filling of the tank with liquid as recited on page 15, lines 23-32, it does not reasonable provide enablement for the term "filling the tank with a fluid". Applicants believe that the specification enables a person skilled in the art to practice the invention with respect to the scope of claim 60. Applicants cite, as a few examples, the following:

As a first aspect, the present invention is related to a method of removing organic contaminants from a substrate comprising the steps of holding said substrate in a tank, filling said tank with a gas mixture comprising water vapor, ozone and an additive acting as a scavenger.

As a second aspect, the present invention is related to a method for removing organic contaminants from a substrate, comprising the steps of:

holding said substrate in a tank;

filling said tank with a liquid comprising water, ozone and an additive acting as a scavenger; and

maintaining said liquid at a temperature less than the boiling point of said liquid.

As a third aspect, the present invention is related to a method for removing organic contaminants from a substrate comprising the steps of:

holding said substrate in tank;

filling said tank with a fluid comprising water, ozone and an additive acting as a scavenger, and wherein the proportion of said additive in said fluid is less than 1% molar weight of said fluid.

Page 8, lines 3-23.

According to a preferred embodiment, the method can also comprise the step of filling said tank with a liquid comprising essentially water and said additive, the liquid level in said tank remaining below the substrate and wherein said liquid is heated. Said tank is then filled with a saturated water vapor containing said additive. Said tank is further filled with ozone.

Page 11, lines 29-35. Therefore, applicants believe that the specification sufficiently enables one skilled in the art to practice the invention as claimed in claim 60.

In paragraph nine of the Office Action, claims 27-39 and 41-60 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sakon et al. (U.S. Patent No. 5,560,857) in view of Stanford et al. (U.S. Patent No. 5,244,000) and Kern (Hand Book of Semiconductor wafer cleaning technology) and further in view of Sehested et al. (J.Phys.Chem.). The Office Action states that the Sakon reference discloses a cleaning solution comprising an aqueous solution containing hydrogen peroxide and additives such as acetic acid. The Office Action states that the Sakon reference does not teach the use of acetic acid as a scavenger but that it would have been obvious that the acetic acid acts as a scavenger since it is a well known stabilizer of aqueous ozone, as taught by Sehested et al.

The Office Action further states that the Stanford reference describes a method for removing organic contaminants in which liquid can be sprayed. The Office Action states that Stanford et al. describe that after the substrate is treated for removal of contaminants, carbon dioxide is added to deionized water which is applied to neutralize the treated substrate. The Office Action states that the Sakon and Stanford references teach the use of hydrogen peroxide but fail to teach ozone to remove contaminants from a substrate. The Office Action further states

that it would have been obvious to replace hydrogen peroxide with ozone because both are functionally equivalent, as taught by Kern.

In one aspect, the current invention discloses a process wherein ozone in combination with a scavenger removes organic contamination on a substrate. Applicants do not believe that the reference alone, or taken in combination, render the claims as written obvious.

The Sakon reference, in combination with the Stanford, Kern, and Sehested references, do not render the current invention obvious for several reasons. First, the Sakon reference is directed to a different problem. Sakon et al. disclose a process for cleaning a semiconductor substrate and silicon oxides. The solution in Sakon is used for reduction of metallic contamination and for particles adhered on the surface. The cleaning solution contains  $\text{HF}$ ,  $\text{H}_2\text{O}_2$  and  $\text{H}_2\text{O}$ .  $\text{HF}$  is used for the etching properties, since a small amount of the silicon or silicon oxide layer will be etched away. This is typical for cleaning of silicon or silicon oxide surfaces.  $\text{H}_2\text{O}_2$  is used for the oxidizing properties. It is generally known in the art that cleaning solutions for cleaning silicon substrates are different from cleaning solutions for organic material removal. Thus, the present invention is directed toward a different problem addressed in Sakon. Second, as noted in the Office Action, Sakon does not disclose the use of ozone, but instead discloses hydrogen peroxide. Third, Sakon discloses the use of acetic acid but for an entirely different purpose – not for use as a scavenger. In the present invention, the aim of adding an additive acting as scavenger is to reduce the amount of free OH radicals, such that the decomposition of  $\text{O}_3$  is more controlled. A scavenger is a compound that counteracts the unwanted effects of another compound being present in the solution. Thus, the present invention as claimed includes a “scavenger” in combination with “ozone,” neither of which is disclosed in Sakon.

Moreover, the Stanford reference is different from the present invention for at least two reasons. First, Stanford adds acetic acid in a step following the cleaning step, and not in the cleaning solution itself, as noted in the Office Action. Second, the Stanford reference adds acetic acid, not to act as a scavenger (not to assist in cleaning of the substrate), but rather to neutralize the solution. Specifically, the acetic acid will act as neutralizing agent and not as a scavenger since there are substantially no radicals present in the solution. Therefore, the combination of Sakon with Stanford does not lead to the present invention, since the field of the invention and the cited references are different.

In paragraphs eleven and thirteen of the Office Action, claim 27, 49 51, and 60 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting. Upon allowance of claims in the present cases, applicants will submit a terminal disclaimer in the co-pending case.

### **CONCLUSION**

If for any reason, the application is not considered to be in condition for allowance on the next Office Action and an interview would be helpful to resolve any remaining issues, the Examiner is requested to contact the undersigned attorney at (312) 913-0001.

Respectfully submitted,

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